

Choose the Best Countertop Material for Your Home and the Environment by [Green Home Guide Staff](#)



Key Considerations

Because of the beating [countertops](#) take over their lifetime, durability and stain resistance are key considerations. “The truth is that there is no such thing as a burn-proof, scratch-proof, stain-proof countertop material—green or conventional—no matter what some manufacturers will claim,” says designer Lydia Corser of Eco Interiors in Santa Cruz, CA. “The most important thing to realize is that nothing is foolproof.”

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Lifecycle Thinking

When weighing the pros and cons of different countertop materials, remember that your countertop’s environmental impact begins long before it is installed in your kitchen or bathroom and will continue after you dispose of it. Here is a basic rundown of key considerations:

- **Raw materials:** Are the materials used to create the countertop renewable or finite, and can they come from recycled products? Are they mined or harvested, and if so, how well managed are these processes? For example, mining the metals to produce stainless steel is very energy intensive and in some cases highly polluting, but stainless can be easily recycled. To go a [step](#) further, using salvaged material is often best for the environment since it avoids even the energy necessary to recycle.
- **Manufacture:** Materials that require less processing use less energy, and so have less impact. [Ceramic tiles](#) must be fired twice, consuming great amounts of energy, while untreated wood only has to be sawed and planed, using far less.
- **Transport:** The distance a material travels translates directly into air pollution from vehicle fuel combustion, which is responsible for emissions of sulfur and nitrous oxides, particulate matter, and carbon monoxide. Local materials from within a 500-mile radius are always preferable to reduce air pollution, since emissions can lead to acid rain, ground-level ozone formation, increased asthma rates, and breathing difficulty, according to the U.S. [EPA](#).
- **Installation:** Dust from sawing and grinding as well as VOCs and other chemicals from adhesives can make your home inhospitable during and after installation. Check with your installer to minimize these impacts.
- **Use and maintenance:** In place, materials may off-gas formaldehyde, VOCs, or other chemicals, but selecting specific materials with low impacts on air quality will cut emissions. For example, look for laminates without formaldehyde in their particleboard backing. Durability is also a major factor, directly linked to a material's lifespan and how often it must be replaced. Laminates are not very durable, but can last 20 years with conscientious care. Using low-impact cleaning materials will ensure that this care is not at the expense of your indoor air quality.
- **End of life:** Where will your countertop end up when its life is over? Can it be recycled, reconditioned and reused, down-cycled into other products, or will it simply be sent to a landfill? Making your unwanted materials available for other uses helps avoid the extraction impacts of mining and keeps harmful chemicals out of the environment. For example, crushing concrete for use as aggregate in new concrete avoids mining of more aggregate.

When choosing a countertop material, keep in mind that “being green is not a black-and-white issue. All products have some green and some not-so-green characteristics. There is no material with zero impact on our planet,” says architect Eric Corey Freed.

But plastic is so easy to care for!

Plastic [solid surface](#) materials are extremely popular due to their resistance to stains and bacterial growth, their very low impact on indoor air quality, and the ability to grind out stains and imperfections.

However, these countertops also have many undesirable aspects:

- They are made primarily from nonrenewable resources: petrochemicals and aluminum trihydrate (ATH). Petrochemicals are processed from petroleum, a finite resource that is

energy-intensive and polluting to extract, ship, and process. ATH is strip-mined, disturbing very large swaths of land, and ATH may not come from recycled sources, even though aluminum recycling rates are high.

- Producing these materials uses high-energy industrial processes.
- While plastic solid surface materials can be recut and reused, or reconditioned in place, they usually cannot be recycled.

Materials in depth

For a summary of the environmental pros and cons of the materials discussed here, see GreenHomeGuide's [Countertops Buyer's Guide](#).

Concrete

Concrete is a mixture of cement, water, and an aggregate, typically sand. It is highly durable and can be poured in place for custom counters. It is not inherently a green product—cement production and transportation are extremely energy-intensive. But if the aggregate is recycled and locally sourced, the energy intensity falls.

Cement is the ingredient with the largest environmental impact. Global cement production is the third-largest producer of man-made CO₂, a greenhouse gas linked to climate change; different sources estimate it accounts for 2.5 to 8 percent of total CO₂ releases. Luckily, cement makes up only about 12 percent of concrete by weight, and 30 percent or more of it can, and should, be substituted with fly ash, a leftover material from coal-fired power plants. Fly ash is rendered inert during the chemical reaction that forms concrete, so it is not a health concern, and concrete does not offgas harmful chemicals.

Concrete can be molded into custom shapes in place and dyed almost any color or given distinctive blended looks, though you should inquire about the toxicity of dyes. Installation and grinding concrete can generate large quantities of dust, so make sure your contractor addresses this. Once cast into countertops, concrete can withstand heat very well. However, concrete counters should be sealed periodically to limit stains, water damage, and bacterial growth, and heat can damage the seal. Treated well, concrete can last a lifetime.

At the end of its life as a countertop, concrete can be reused whole or cut for other projects. Unwanted concrete can even be crushed into new aggregate for producing new concrete, saving energy over mining more resources to produce new concrete, as well as keeping old concrete out of landfills, according to research by the [Portland Cement Association](#).

According to [Ask the Builder](#), a concrete countertop can be a DIY project for a skilled homeowner. For specific product recommendations, read Low Impact Living's "[Concrete for Green Countertops and Flooring](#)" and consult the [GreenSpec directory](#) of countertop products.

Laminate

Laminates are resin-impregnated paper glued to a particleboard backing. The particleboard backing typically has high VOC levels, and the laminates are most often glued to cabinet boxes using high-VOC glues. However, compared to plastic-based solid surfaces, laminates use a very small amount of resin.

Though laminates are not considered green, if the paper and plastic come from recycled sources, their impact can be reduced. Look for laminates made of recycled plastics and recycled, formaldehyde-free paper, that use nontoxic low-VOC glues for installation or that avoid glues by using mechanical fasteners. In terms of air quality, look for laminates that have been certified by [Greenguard](#) as low-emitting materials. When installing laminates, avoid first installing plywood (which typically offgasses VOCs) on top of the cabinet boxes. The laminate's backing should ideally be mechanically fastened to the cabinets, to preserve air quality.

Laminates are inexpensive and easy to clean, but they are easily marred by heat and nicks if not treated with care, so always use trivets and cutting boards in the kitchen. In the bathroom or laundry room there is less danger of damage, as laminates are chemical resistant. Their lifespan is relatively short: typically 10 to 20 years, depending on how well you treat them.

Laminates are not recyclable, and are difficult to remove and reuse if glued in place, so they quickly end up in landfills. This puts them behind many other counter choices environmentally.

Solid Surface: Paper Composite

Paper composite surfaces are composed of paper and other fibers that have been impregnated with resin. Paper composite handles heat well, is very durable and, according to Corser, "if folks are worried about staining ... nothing seems to penetrate the darker colors, in my experience."

Maintaining paper composites over their long lives will reduce their overall environmental impact; a nonabrasive cleaner and a sponge are adequate for routine cleanings. This material does not nick easily or dull knives (it's often used in cutting boards), though, as with all materials, be wary of cutting directly on it to prolong the life of your counter as well as your knives. Many paper composite products can be sealed with mineral oil to improve moisture and stain resistance.

The resin does not come from recycled sources, but it constitutes a small amount of the material used. Because the resin is a thermoset plastic, paper-based solid surfaces are not recyclable, though they can be recut and retooled for future use. Overall, solid-paper composites are environmentally preferable to plastic-based solid surfaces since wood is a renewable resource while petroleum is not. Look for paper-composite countertop products that use pulp from sustainably managed forests and that incorporate recycled (especially post-consumer recycled) paper.

For specific product recommendations, see Sunset magazine's "[Eco-Friendly Kitchen Counters](#)" and consult the [GreenSpec directory](#) of environmentally preferable building products.

Solid Surface: Plastic Countertop

Plastic solid-surface countertops that incorporate recycled materials have a lower environmental impact than the typical plastic countertops mentioned above. These range widely in look, recycled content, recyclability, and composition. Some are made of compressed yogurt containers and aluminum, while others end up looking close to terrazzo. Recycled plastic surfaces are typically quite long lasting, resist moisture, and do not offgas VOCs—but they burn easily, can be scratched, and may warp, according to architect Andrea Traber.

Stainless Steel

Stainless steel is an alloy of steel, nickel, and at least 10.5 percent chromium. Because of the impacts of mining, particularly those associated with chromium mining, and the energy used to produce it, stainless steel is not inherently a green material. However, stainless steel typically contains 65 to 80 percent recycled content—up to 100 percent is available—and it's fully recyclable. (To find a steel recycler, use this [recycler locator](#) from the Steel Recycling Institute.)

Recycling steel uses a fraction of the energy required to produce it from virgin sources. Reclaimed stainless steel sheeting and fixtures are sometimes available from waste exchanges and specialty dealers.

Stainless steel countertops offer very high durability and low maintenance, and do not offgas. They scratch easily and show fingerprints, but if stainless steel is sanded to a brushed finish, it helps hide prints. Scratches can be reconditioned in place if they are shallow, though the nicks and marks of daily use give stainless steel a nice patina over time. Leaving extremely hot pots on stainless steel may mar it.

For more information about recycled-metal countertops, see Sunset magazine's "[Eco-Friendly Kitchen Counters](#)."

Stone

There is a wide range of stone available as countertop material. Stone is a natural material, but is not renewable or recyclable; it can only be downcycled into smaller slabs for other applications. Because it is quarried, it can have high environmental impact and can take a lot of energy to produce.

Buying locally helps reduce energy used in transit. Granite is popular, but is only environmentally preferable in states like New Hampshire where it is quarried. There are granite quarries in California as well, but serpentine (which is similar to soapstone) would be lower impact in California, since it is abundant and mined closer to the surface. Salvaged stone is sometimes available at salvage yards and avoids mining impacts altogether.

Stone is extremely durable and will last as long as your house, with certain caveats. Placing very hot materials on stone counters may damage the sealer used to increase water- and stain-resistance. Without being sealed, stone can easily be stained, especially by oils, and can be susceptible to bacteria if the type of stone is porous. If grinding and polishing take place in the home during installation, make sure dust is minimized.

Stone will not offgas VOCs, although there is some debate about radon emissions from stone. The consensus of many experts is that there is not enough radon in stone used in the home to affect you, according to architect Cassandra Adams. For more information on stone as a building material, see her [article on stone and tile](#) in GreenHomeGuide.

Terrazzo (recycled glass)

Terrazzo consists of crushed stone and glass set in a cement or epoxy substrate that is buffed smooth. Overall, terrazzo can be a good green choice due to its 40-year-plus lifespan, low maintenance, and high recycled content, especially if you use local materials to avoid the transportation-related energy and emissions. Glass, stone, and other recycled materials can make up as much as 95 percent of the materials in terrazzo.

The environmental and health impacts lie in the epoxy or cement substrate, which is up to 30 percent of the terrazzo. Epoxy is petroleum-derived, cannot be recycled, and can contain a number of potentially harmful chemicals such as phthalates. Once epoxy has cured, it has little impact on air quality, is non-porous and does not need to be sealed.

Cement binders have high embodied energy and contribute greatly to global CO₂. Cement-based terrazzo should be sealed to limit staining. It resists scratches extremely well. It can be crushed and incorporated into new terrazzo, effectively recycling it. Grinding down terrazzo of either type to a smooth finish will generate dust and should be handled professionally.

For specific product recommendations, see Sunset magazine's "[Eco-Friendly Kitchen Counters](#)" and consult the [GreenSpec directory](#) of environmentally preferable building products.

Ceramic Tile

Ceramic and porcelain tiles consist of natural clays, minerals, and sands fired hard and usually glazed and fired again for a smooth water- and heat-proof finish. Extracting the materials and performing two high-temperature firings consumes a large amount of energy (though less than stainless steel recycling, for example), and shipping finished tiles is energy-intensive due to their weight.

On the other hand, ceramic tiles can contain up to 70 percent recycled materials, from ground recycled metals and minerals to post-consumer glass, which increases tiles' durability. Using recycled materials offsets some of the energy of mining new materials. Buying tiles that use local materials and that are produced locally will further cut down on transportation energy. Many areas of the country still have local ceramics industries. If you're buying imported tiles, look out for glazes containing lead or toxic materials, which are not always regulated overseas.

Durability is quite high for tile, though it should be professionally installed to ensure long life. Corser recommends that you select large, uniform tiles to reduce the amount of grout needed and that you keep grout lines thin (grout can be a hassle to clean). Use an unsanded, water-based (also called latex-based) grout to cut down on VOCs and mold growth. Keep tiles dry and clean them at least once a month. Cutting and preparing food directly on tile is not recommended.

As individual tiles wear or chip, you can replace them without having to redo your entire counter, further increasing the counter's lifespan; plan for this by buying a little extra tile initially. At the end of your counter's life, removing all of the tiles intact is difficult, and they cannot be easily cycled into new products other than aggregate for terrazzo or concrete.

For specific product recommendations, consult the [GreenSpec directory](#) of environmentally preferable building products.

Glass Tile

Glass tiles can be environmentally preferable to ceramic since they can have 100 percent recycled content. The production process for recycling glass into tiles, called sintering, consumes far less energy than making new tiles from virgin materials. Glass tiles scratch more easily than ceramic, however, and may be less uniform, making more grout necessary. Their potential surface irregularity may affect their use as countertops, which is why architects and designers often recommend using them only as accents or backsplashes.

As with ceramic tiles, locally produced tiles are environmentally preferable. Glass tiles do not offgas VOCs if water-based grout is used.

Glass tiles are easier than ceramic to reuse or recycle, but removing them is just as difficult.

For specific product recommendations, consult the [GreenSpec directory](#) of environmentally preferable building products.

Wood

Using untreated hardwood certified by the [Forest Stewardship Council](#) (FSC) for your countertop is the best choice on strictly environmental terms, according to architect Eric Corey Freed. FSC-certified wood from local, sustainably managed forests cuts down on shipping costs and energy. Unlike the other material types listed here, untreated wood is truly a renewable resource, and it requires relatively much less industrial processing. But growing and harvesting trees is still an environmentally disruptive activity, so salvaged wood is environmentally preferable.

In your home, wood should be kept from continually wet areas, such as the space immediately surrounding a sink. It can also be burned, scorched, dented and stained, so it requires care and regular cleaning. Otherwise, kept sealed with natural mineral oil to prevent drying, wood is a highly durable and healthy counter material. Mechanically fastening a wood countertop avoids adhesives and makes removal easier.

At the end of its use as a countertop, wood can be reused, given to materials exchanges or, if never treated with toxic materials, chipped and composted or allowed to biodegrade.

For specific product recommendations, consult the [GreenSpec directory](#) of environmentally preferable building products.

